CLAIMS

1. A hard magnetic compound, characterized in that:

the hard magnetic compound is represented by a general formula $R(Fe_{100-y-w}Co_wTi_y)_xSi_zA_v$ (in the general formula, R is at least one element selected from rare earth elements (here the rare earth elements signify a concept inclusive of Y), Nd accounts for 50 mol% or more of R, and A is N and/or C); and

the molar ratios in said general formula are such that x = 10 to 12.5, y = (8.3 - 1.7 × z) to 12.3, z = 0.1 to 2.3, v = 0.1 to 3 and w = 0 to 30, and the relation (Fe + Co + Ti + Si)/R > 12 is satisfied.

2. The hard magnetic compound according to claim 1, characterized in that said hard magnetic compound shows a single phase consisting of a phase having a $ThMn_{12}$-type structure.

3. The hard magnetic compound according to claim 1, characterized in that Nd accounts for 70 mol% or more of said R.

4. The hard magnetic compound according to claim 1, characterized in that said R is partially substituted with Zr and/or Hf.

5. A hard magnetic compound, characterized in that:

the hard magnetic compound is represented by a general formula $R1_{1-u}R2_u(Fe_{100-y-w}Co_wTi_y)_xSi_zA_v$ (in the general formula, R1 is at least one element selected from rare earth elements (here, the rare earth elements signify a concept inclusive of Y), Nd accounts for 50 mol% or more of said R1, R2 is Zr and/or Hf, and A is N and/or C); and

the molar ratios in said general formula are such that u = 0.18 or less, y = 4.5 to 12.3, x = 11 to 12.8, z = 0.1 to 2.3, v = 0.1 to 3 and w = 0 to 30, and the relation (Fe + Co + Ti + Si)/(R1 + R2) > 12 is satisfied.

6. The hard magnetic compound according to claim 5, characterized in that said hard magnetic compound comprises the $ThMn_{12}$-type structure.

7. The hard magnetic compound according to claim 5, characterized in that said u is 0.04 to 0.06.

8. The hard magnetic compound according to claim 1 or 5, characterized in that said A is N.

9. The hard magnetic compound according to claim 1 or 5, characterized in that said x is 11 to 12.5.

10. The hard magnetic compound according to claim 1 or 5, characterized in that said z is 0.2 to 2.0.

11. The hard magnetic compound according to claim 1 or 5, characterized in that said v is 0.5 to 2.5.

12. The hard magnetic compound according to claim 1 or 5, characterized in that said w is 10 to 25.

13. A hard magnetic compound, characterized in that:

the hard magnetic compound is comprised of a compound represented by a general formula R-Ti-Fe-Si-A or R-Ti-Fe-Co-Si-A (in the general formula, R is at least one element selected from rare earth elements (here the rare earth elements signify a concept inclusive of Y), Nd accounts for 80 mol% or more of said R, and A is N and/or C);

the hard magnetic compound shows a single phase consisting of a hard magnetic phase; and

the saturation magnetization (σs) thereof is 120 emu/g or more, and the anisotropic magnetic field (H_A) thereof is 30 kOe or more.

14. The hard magnetic compound according to claim 13, characterized in that said hard magnetic phase is a phase having a $ThMn_{12}$-type structure.

15. The hard magnetic compound according to claim 13, characterized in that said anisotropic magnetic field (H_A) is 40 kOe or more.

16. The hard magnetic compound according to claim 13, characterized in that said saturation magnetization (σs) is 130 emu/g or more.

17. A hard magnetic compound, characterized in that:

the hard magnetic compound shows a single phase consisting of an intermetallic compound in which the molar ratio of T to R (R is at least one element selected from rare earth elements (here, the rare earth elements signify a concept inclusive of Y), and T is a combination of transition metal elements indispensably including Fe and Ti) falls in the vicinity of 1:12; and

Si and A (here, A is N and/or C) are located as interstitial elements in the crystal lattice of said intermetallic compound.

18. The hard magnetic compound according to claim 17, characterized in that:

when the ratio between the lattice constant of the c-axis and the lattice constant of the a-axis in the crystal lattice of said intermetallic compound is represented by c1/a1, and the ratio between the lattice constant of the c-axis and the lattice constant of the a-axis in the crystal lattice of the $ThMn_{12}$-type compound based on ASTM (American Society For Testing and Materials) is represented by c2/a2 (c2/a2 = 0.558), the relation, c1/a1 > c2/a2, holds.

19. The hard magnetic compound according to claim 17, characterized in that Si anisotropically shrinks the crystal lattice and A isotropically expands the crystal lattice, and the relation c1/a1 > c2/a2 is thereby obtained.

20. The hard magnetic compound according to claim 17, characterized in that the molar ratio of R to T is 1:10 to 1:12.5.

21. A permanent magnet powder, characterized in that:

the composition of the permanent magnet powder is represented by a general formula $R(Fe_{100-y-w}Co_wTi_y)_xSi_zA_v$ (in the general formula, R is at least one element selected from rare earth elements (here the rare earth elements signify a concept inclusive of Y), Nd accounts for 50 mol% or more of said R, and A is N and/or C);

the molar ratios in said general formula are such that $x = 10$ to 12.8, $y = (8.3 - 1.7 \times z)$ to 12.3, $z = 0.1$ to 2.3, $v = 0.1$ to 3 and $w = 0$ to 30, and the relation $(Fe + Co + Ti + Si)/R > 12$ is satisfied; and

the permanent magnet powder is comprised of a population of particles in which the mean grain size is 200 nm or less.

22. The permanent magnet powder according to claim 21, characterized in that said particles have as the main phase a phase having the $ThMn_{12}$-type structure.

23. The permanent magnet powder according to claim 21, characterized in that said particles show a single phase consisting of a phase substantially having the $ThMn_{12}$-type structure.

24. The permanent magnet powder according to claim 21, characterized in that Nd accounts for 70 mol% or more of said R.

25. A method for producing a permanent magnet powder, characterized by comprising the steps of:

producing a powder subjected to quenching and solidification wherein:

the composition of the powder is represented by a general formula $R(Fe_{100-y-w}Co_wTi_y)_xSi_z$ (in the general formula, R is at least one element selected from rare earth elements (here the rare earth elements signify a concept inclusive of Y), Nd accounts for 50 mol% or more of said R); and

the molar ratios in said general formula are such that $x = 10$ to 12.8, $y = (8.3 - 1.7 \times z)$ to 12.3, $z = 0.1$ to 2.3 and $w = 0$ to 30, and the relation $(Fe + Co + Ti + Si)/R > 12$ is satisfied;

heat-treating said powder so that the powder is maintained in an inert atmosphere at 650 to 850°C for 0.5 to 120 hours; and

nitriding or carbiding said heat-treated powder.

26. The method for producing a permanent magnet powder according to claim 25, characterized in that the structure of said quenched and solidified powder is any one of an amorphous phase, a mixed phase composed of an amorphous phase and a crystalline phase and a crystalline phase.

27. The method for producing a permanent magnet powder according to claim 25, characterized in that said quenching and solidification is conducted by the single roll casting method, and the peripheral velocity of the roll in use is 10 to 100 m/s.

28. The method for producing a permanent magnet powder according to claim 25, characterized in that said heat treatment crystallizes the amorphous phase, or regulates the size of grains constituting the crystalline phase.

29. A bonded magnet comprising a permanent magnet powder and a resin phase to bind said permanent magnet powder, characterized in that:

the composition of the crystalline hard magnetic particles constituting said permanent magnet powder is represented by a general formula $R(Fe_{100-y-w}Co_wTi_y)_xSi_zA_v$ (in the general formula, R is at least one element selected from rare earth elements (here the rare earth elements signify a concept inclusive of Y), Nd accounts for 50 mol% or more of said R, and A is N and/or C); and

the molar ratios in said general formula are such that $x = 10$ to 12.8, $y = (8.3 - 1.7 \times z)$ to 12.3, $z = 0.1$ to 2.3, $v = 0.1$ to 3 and $w = 0$ to 30, and the relation $(Fe + Co + Ti + Si)/R > 12$ is satisfied.

30. The bonded magnet according to claim 29, characterized in that the mean grain size of said hard magnetic particles is 200 nm or less.